



1. Indoor Air Quality Guidelines

A. General

The following guidelines are intended to outline processes and methods to minimize adverse Indoor Air Quality (IAQ) conditions on the occupants of buildings designed and constructed under the direction of the Division of Engineering and Architectural Services. Applicability of these guidelines for specific projects will be determined by the Project Manager and the Client Agency and will be incorporated into the A/E Agreement. For those projects these guidelines shall be met by both the Architect/Engineer (A/E) consultant and the contractor to assure acceptable IAQ conditions are provided to the initial occupants of the building and over the life of the building. Compliance with this guideline is considered to be a basic service.

B. IAQ Considerations

The A/E shall incorporate the following IAQ considerations into the design and construction documents:

- 1) Maintain strict pollutant source control by specifying materials and substances which are designed, manufactured, handled and installed in such a manner that they will produce the least harmful or annoying effect on the occupants of the building.
- 2) Provide an adequate outdoor air supply to the building which is protected from exterior pollutant sources, including the building's own exhaust and venting systems, cooling tower mist, parking areas, loading docks and smoking areas. Consider 3-stage intake air filtration consisting of pleated pre-filters, charcoal, and bag/box filters to take out a high proportion of the 1 μ m + aerosols.
- 3) Provide floor coverings appropriate for areas of use based on potential exposure to water, foot traffic, food spills and other contaminants.
- 4) Provide adequate and effective fresh air delivery to occupants and including special purpose areas.
- 5) Provide properly designed exhaust systems to remove pollutants generated within the building before they are redistributed through the occupied space. The exhaust systems shall be designed for compatibility not only with the building's air intake system(s), but also for compatibility with adjacent buildings and with future development in accordance with the site master plan.
- 6) Provide building design which will protect building occupants from infiltration, both natural and stack effect, of carbon monoxide, particulates and other pollutants from external sources, and radon from ground sources.
- 7) The design of the internal Heating, Ventilating, and Air Conditioning (HVAC) delivery systems shall incorporate the ability to redirect, without great expense, the internal air flows as occupancy and activity patterns change over the life of the building.
- 8) Acoustical insulation on the interior wall of the ventilation ducts shall not be used to achieve noise level of the ventilation system at or below 45 dBA in all work areas.
- 9) Provide documentation describing:
 - a) The amount and type of chemical vapors or particles which may be emitted from materials introduced into the workspace; and



- b) The building design with the mechanical HVAC systems design including zoning.
- 10) Provide training to the building maintenance and operations personnel to ensure a thorough understanding of the IAQ goals, their role in meeting the goals, and how the HVAC systems should be operated to meet the goals

C. Indoor Pollutant Source Control Plan

The A/E shall develop and implement an Indoor Pollutant Source Control Plan indicating how the Emission Rate Standards that follow will be implemented. The Plan shall apply to all interior construction materials, finishes and furnishings including partitions, wall coverings, flooring, floor coverings, ceiling tiles, adhesives, paints, sealants, glazes, insulation, duct work, wiring and other materials which may have chemical content.

- 1) Design documents shall require that all appropriate suppliers be made aware of the IAQ goals and the requirements to comply with the Emission Rate Standards.
- 2) Where possible, materials used shall emit the lowest, yet technologically achievable, emissions of chemical vapors and particles.
- 3) Emission Rate Standards: The following are performance based, after the fact with the ventilation system operating:
 - a. Formaldehyde Emission Rate Standard: The product emission rate shall not result in an indoor air concentration level of formaldehyde greater than the NIOSH Recommended Exposure Limit of 0.016 parts per million.
 - b. Total Volatile Organic Compound (VOC) Emission Rate Standard: The product emission rate shall not result in an indoor air concentration level greater than 0.5 mg/m³ of total volatile organic compounds.
 - c. 4 Phenyl Cyclohexene (4-PC) Emission Rate Standard: The carpet emission rate shall not result in an indoor air concentration level greater than 1 part per billion.
 - d. Total Particulates Emission Rate Standard: The product emission rate shall not result in an indoor air concentration of greater than 50 ug/m³ total particulates in non-office and 10 ug/m³ for 8 hour TWA in office areas.
 - e. Regulated Pollutant Standard: Any pollutant regulated as a primary or secondary air pollutant shall meet an emission rate standard that will not generate an air concentration greater than that promulgated by the National Ambient Air Quality Standard (USEPA, Code of Federal Regulations, Title 40, Part 50).
 - f. Other Pollutant Standard: Any pollutant not specifically mentioned in subparagraphs 3.3.1 through 3.3.4 shall meet an emission rate standard that will not produce an air concentration level greater than 1/10 the Threshold Limit Value - Time Weighted Average (TLV-TWA) industrial workplace standard or 0.5 mg/m³ of total VOCs whichever is less.
- 4) As part of the Shop Drawing process, the A/E shall include a requirement that the contractor provide compliance information and Material Safety Data Sheets (MSDS) on all indoor construction material. Additionally, that the contractors disclose, in writing and prior to installation, information on those VOCs found to be emitted by the products and known



to be carcinogens, mutagens, reproductive toxins, or compounds emitted to cause an air concentration of not greater than 0.1 ppm or 1/10 the TLV whichever is less.

- 5) All emission rate testing pertinent to air quality shall be done in accordance with ASTM D5116-90, Small Scale Environmental Determination of Organic Emissions from Indoor Materials/Products. All test data shall be made available to the City of Seattle at its request.
- 6) The least amount feasible of "wet" materials (such as adhesives, sealants, glazes, caulks, paints, etc.) shall be used during construction and product applications. The Plan shall include control strategies for achieving this minimal use requirement.
- 7) "Dry" furnishing materials (such as carpet, acoustical panels, textiles, etc.) shall not be installed until "wet" materials have been applied and allowed to dry to the extent feasible and in accordance with other good building practices. Drying times should be chosen so that pollutant emission rates as set forth above are achieved prior to installation of the "dry" furnishings. Dry furnishings such as carpeting and floor tile shall not be applied to the cement floors until the moisture content of the cement is below 16%.
 - a) All dry furnishing and materials (such as carpet, floor tile, acoustical tile, textiles, office furniture, wood shelving, etc.) shall be allowed to "air-out" in clean environments prior to installation in a building.
 - b) All indoor construction material shall be protected from contamination by construction dust, debris, and fumes during all phases of construction, both before and after installation.

D. Ventilation Control Plan

The A/E shall develop a Ventilation Control Plan, which includes an analysis of the adequacy and effectiveness of the proposed mechanical HVAC system covering the following factors:

- 1) Location of building outdoor air intakes to ensure an acceptable quality of outdoor air.
- 2) Location of building exhausts, plumbing vents and other pollutant sources to prevent reentrainment of exhausted or polluted air back into the building.
- 3) Integration of building air intake and exhaust locations with the overall site master plan to optimize the quality of outdoor air intake for all buildings on adjacent sites.
- 4) The ability of the building exhaust system to ensure external exhaust of pollutants and odors created in laboratories, building support areas, cafeteria, break rooms, printing areas photocopy areas, and other special purpose areas; and treatment of those exhausts, if appropriate, to eliminate particles and toxic pollutants from the air before exhausting it.
- 5) The ability of the HVAC system to provide: 1) an adequate ventilation rate of outdoor air to the ultimate expected building population and usage, and 2) adequate make-up air, as appropriate, for special purpose areas.
- 6) The ability to achieve acceptable ventilation effectiveness in the occupied zones with a maximum CO₂ level of less than 600-700 ppm under maximum normal loading.
- 7) The ability to effectively integrate the air delivery system with the occupied space activities and space design.



- 8) The ability of the building to provide protection of its occupants against infiltration, both natural and stack effect, of the following:
 - a) Carbon monoxide, aerosols, and other pollutants from the parking areas, loading dock areas, smoking areas, and other pollutant sources external to the building.
 - b) Radon from ground sources.

E. Additional Environmental Controls

- 1.) To prevent and/or inhibit the degradation of IAQ in adjacent occupied buildings during construction, the following shall be observed:
 - a) Minimize the amount of construction dust, vapors and fumes generated at the construction site;
 - b) Provide temporary source of outdoor air, if required, to prevent construction dust and fumes from infiltrating into the adjacent building's mechanical system; and,
 - c) Recondition the air systems of adjacent buildings, affected by the construction project, to at least the pre-construction cleanliness conditions.
 - d) During construction the site should be maintained so that there no moisture infiltration that could all cause future problems (e.g. wet insulation, wet flooring material, wet sheet rock, etc).
 - e) Before any material is placed on concrete surface the moisture content shall be measured to insure that it is within specification.
- 2) To prevent and/or inhibit the degradation of indoor air quality in occupied portions of buildings during renovation projects, the following shall be observed:
 - a) If possible, schedule renovation projects to occur during favorable weather seasons and/or conditions;
 - b) Separate and section off the area where renovation is to be performed from the remaining space or perform work during non-operating hours. Space shall be thoroughly cleaned and flushed with outdoor air prior to occupancy; and,
 - c) Prevent construction dust and fumes from infiltrating into the building's mechanical system.

F. Indoor Air Quality Operations Plan

The A/E shall provide a building indoor air quality operations plan, which includes, but is not limited to, the following:

- 1) HVAC design and operating documentation as recommended by the equipment manufacturers and the design engineer;
 - a) Information on the daily operation and management of the building systems, a description of normal operating procedures, special procedures such as seasonal start-ups and shutdowns, and a list of operating performance criteria including, but not limited to minimum outside air ventilation rates, special space relative humidity and pressurization requirements;



- b) A general description of the building and its function including but not limited to, work activity, number of employees and visitors, hours of operation, weekend use, and potential air contaminants which could be released into the space.
- 2) The scope of work for the initial balancing of the HVAC system at the occupied zone before Substantial Completion and before final Acceptance;
- 3) A recommended program for re-balancing of the HVAC system at seasonal changes;
- 4) A recommended building flush out period of high ventilation at ambient temperatures (100% outside air) which shall take place after completion of all interior construction and prior to placing any furniture in the ventilated space, and another flush out period after all furniture has been unpacked and placed in the ventilated space, all of which shall be scheduled and occur prior to Substantial Completion (Balancing and Commissioning may take place during this flush out period);
- 5) The requirements for an extended ventilation flush period after Substantial Completion and occupancy at the normal ventilation rate (Include length of time for 24 hour per day operation and length of time and duration for early start up of HVAC systems); and,
- 6) The scope and content of a training program for the State's maintenance staff to properly operate and maintain the HVAC systems under all operating conditions to meet IAQ goals and ventilation standards.

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